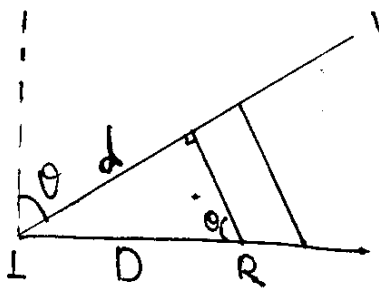
Solution to HW 7

1. 

a) Key idea here is that the time delay Δt is due to the distance d that each wavefront must travel to reach your Left ear (L) after it reach your right ear (R). From figure, we see

$$\Delta t = \frac{d}{v} = \frac{D\sin\theta}{v}$$

b) Key idea: now the speed of sound sussitituted sy v_w.

$$\therefore \Delta t_w = \frac{D\sin\theta}{v_w}$$

∵ wavefrong arrives from directly to the right. ∴ $\theta = 90°$

$$\therefore \Delta t_w = \frac{D}{v_w}.$$

therefore, if $\Delta t = \Delta t_w$.

we have $\frac{D}{v_w} = \frac{D\sin\theta}{v} \Rightarrow \sin\theta = \frac{v}{v_w} = \frac{343}{1482} = 0.231$

$$\theta = 13°.$$

2. a) let v represent the emitted frequency, $|v|$ represent the sound speed, and $|v_s|$ represent the source speed. Since the bird is flying directly away from the observer, the received frequency